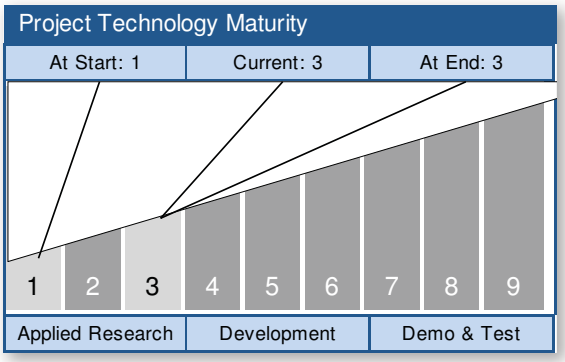
Plume Mitigation: Soil Erosion And Lunar Prospecting Sensor Project

Center Innovation Fund: KSC CIF Program

Space Technology Mission Directorate (STMD)

National Aeronautics and Space Administration

Plume Mitigation: Soil Erosion and Lunar Prospecting Sensor



ABSTRACT

Demonstrate feasibility of the simplest, lowest-mass method of measuring density of a cloud of lunar soil ejected by rocket exhaust, using new math techniques with a small baseline laser/camera system.

Technology Area: Human Exploration Destination Systems TA07 (Primary)
Entry, Descent & Landing Systems TA09 (Secondary)

ANTICIPATED BENEFITS

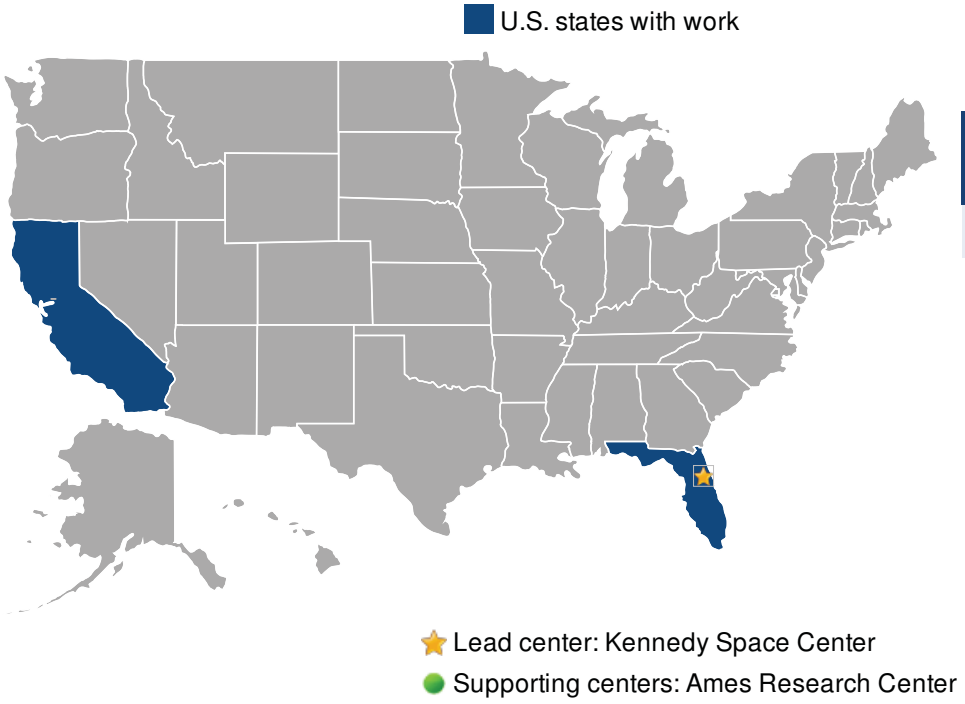
To NASA funded missions:

It is critically important for NASA to create reliable methods for predicting the risks and expected hardware damage from high velocity, ejected soil during lunar landings. These ejecta can sandblast and potentially ruin any sensitive hardware that exists at a lunar outpost, a lunar mining operation, or a historic Apollo site, when it is in the vicinity of a landing spacecraft.

To the commercial space industry:

There has also been increased economic interest by commercial space mining companies...

Read more on the last page.



Other Organizations Performing Work
QinetiQ North America/ESC

DETAILED DESCRIPTION

Focus is on exploring the erosion process that occurs when the exhaust plume of a lunar rocket impacts the regolith. Also, predicting the behavior of the lunar soil that would be blasted from a lunar landing/launch site shall assist in better design and protection of any future lunar settlement from scouring of structures and equipment. NASA is gathering experimental data to improve soil erosion models and understand how lunar particles enter the plume flow.

MANAGEMENT

Program Executive:
John Falker

Program Manager:
Karen Thompson

Project Manager:
Nancy Zeitlin

Principal Investigator:
Philip Metzger

TECHNOLOGY DETAILS

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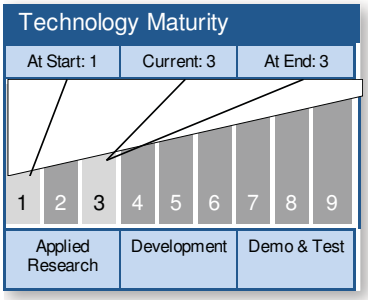


TECHNOLOGY DESCRIPTION

- Although NASA has mastered the art of landing on the moon, there is still much of the lunar environment worth studying. Lunar dust or regolith is just one of the many elements that remains challenging for scientists and engineers because its extremely fine composition poses a threat to hardware on robotic and construction missions to the moon.

  In 2012, NASA's Center Innovation Fund (CIF) Program supported the development of a look-down soil sensor project at Kennedy Space Center (KSC) to help measure the optical properties of blowing lunar soil—a process known as dust lofting—during a lunar landing. The sensor technology sought to calibrate the erosion rate predictions for the lunar environment while providing valuable data for predicting the risks and expected hardware damage from high velocity ejected soil.

- This technology is categorized as a hardware system for other applications
- Technology Area
  - TA07 Human Exploration Destination Systems (Primary)
  - TA09 Entry, Descent & Landing Systems (Secondary)

It is critically important for NASA to create reliable methods for predicting the risks and expected hardware damage from high velocity, ejected soil during lunar landings. These ejecta can sandblast and potentially ruin any sensitive hardware that exists at a lunar outpost, a lunar mining operation, or a historic Apollo site, when it is in the vicinity of a landing spacecraft. There has also been increased economic interest by commercial space mining companies in extracting high-value metals from lunar or asteroid regolith. Space-based geological...

Performance Metrics		
Metric	Unit	Quantity
Does not apply		

TECHNOLOGY DETAILS

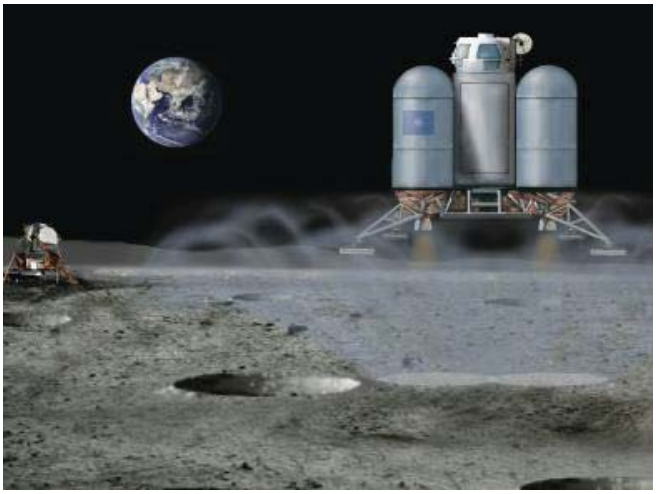
CAPABILITIES PROVIDED (CONT'D)

spectoscopy systems can be massive since they require an optical telescope to gain the fine spatial resolution required for locating specific high-metal deposits.

POTENTIAL APPLICATIONS

This project seeks to develop a sensor to measure blowing soil during a lunar landing and also provide a low-mass, low-cost, low-complexity alternative for detecting valuable mineral deposits.

IMAGE GALLERY



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ANTICIPATED BENEFITS

To the commercial space industry: (CONT'D)

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